

calibrated flow rate devices, such as glass rotameters, may be used in lieu of incremental dry gas meter readings. Proportional rate calculation procedures must be revised, but acceptability limits remain the same.

8.10.4 During the test run, make periodic adjustments to keep the temperature between (or upstream of) the filters at the proper level. Do not change sampling trains during the test run.

8.10.5 At the end of the test run (see Method 28, Section 6.4.6), turn off the coarse adjust valve, remove the probe from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak-check, as outlined in Section 8.8.2. Also, leak-check the pitot lines as described in Method 2, Section 8.1; the lines must pass this leak-check in order to validate the velocity head data.

8.11 Calculation of Proportional Sampling Rate. Calculate percent proportionality (see Section 12.7) to determine whether the run was valid or another test run should be made.

8.12 Sample Recovery. Same as Method 5, Section 8.7, with the exception of the following:

8.12.1 An acetone blank volume of about 50-ml or more may be used.

8.12.2 Treat the samples as follows:

8.12.2.1 Container Nos. 1 and 1A. Treat the two filters according to the procedures outlined in Method 5, Section 8.7.6.1. The filters may be stored either in a single container or in separate containers. Use the sum of the

filter tare weights to determine the sample mass collected.

8.12.2.3 Container No. 2.

8.12.2.3.1 Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe and filter holders by washing and brushing these components with acetone and placing the wash in a labeled glass container. At least three cycles of brushing and rinsing are required.

8.12.2.3.2 Between sampling runs, keep brushes clean and protected from contamination.

8.12.2.3.3 After all acetone washings and particulate matter have been collected in the sample containers, tighten the lids on the sample containers so that the acetone will not leak out when transferred to the laboratory weighing area. Mark the height of the fluid levels to determine whether leakage occurs during transport. Label the containers clearly to identify contents.

8.13 Sample Transport. Whenever possible, containers should be shipped in such a way that they remain upright at all times.

NOTE: Requirements for capping and transport of sample containers are not applicable if sample recovery and analysis occur in the same room.

### 9.0 Quality Control

9.1 Miscellaneous Quality Control Measures.

Section	Quality control measure	Effect
8.8, 10.1–10.4 .....	Sampling equipment leak check and calibration.	Ensures accurate measurement of stack gas flow rate, sample volume.
10.5 .....	Analytical balance calibration .....	Ensure accurate and precise measurement of collected particulate.
16.2.5 .....	Simultaneous, dual-train sample collection.	Ensure precision of measured particulate concentration.

9.2 Volume Metering System Checks. Same as Method 5, Section 9.2.

### 10.0 Calibration and Standardization

NOTE: Maintain a laboratory record of all calibrations.

10.1 Pitot Tube. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Method 2, Section 10.1, prior to the first certification test and checked semiannually, thereafter. A standard pitot need not be calibrated but shall be inspected and cleaned, if necessary, prior to each certification test.

10.2 Volume Metering System.

10.2.1 Initial and Periodic Calibration. Before its initial use and at least semiannually thereafter, calibrate the volume metering system as described in Method 5, Section 10.3.1, except that the wet test meter with a

capacity of 3.0 liters/rev (0.1 ft<sup>3</sup>/rev) may be used. Other liquid displacement systems accurate to within  $\pm 1$  percent, may be used as calibration standards.

NOTE: Procedures and equipment specified in Method 5, Section 16.0, for alternative calibration standards, including calibrated dry gas meters and critical orifices, are allowed for calibrating the dry gas meter in the sampling train. A dry gas meter used as a calibration standard shall be recalibrated at least once annually.

10.2.2 Calibration After Use. After each certification or audit test (four or more test runs conducted on a wood heater at the four burn rates specified in Method 28), check calibration of the metering system by performing three calibration runs at a single, intermediate flow rate as described in Method 5, Section 10.3.2.

NOTE: Procedures and equipment specified in Method 5, Section 16.0, for alternative calibration standards are allowed for the post-test dry gas meter calibration check.

10.2.3 Acceptable Variation in Calibration. If the dry gas meter coefficient values obtained before and after a certification test differ by more than 5 percent, the certification test shall either be voided and repeated, or calculations for the certification test shall be performed using whichever meter coefficient value (*i.e.*, before or after) gives the lower value of total sample volume.

10.3 Temperature Sensors. Use the procedure in Method 2, Section 10.3, to calibrate temperature sensors before the first certification or audit test and at least semiannually, thereafter.

10.4 Barometer. Calibrate against a mercury barometer before the first certification test and at least semiannually, thereafter. If a mercury barometer is used, no calibration is necessary. Follow the manufacturer's instructions for operation.

10.5 Analytical Balance. Perform a multipoint calibration (at least five points spanning the operational range) of the analytical balance before the first certification test and semiannually, thereafter. Before each certification test, audit the balance by weighing at least one calibration weight (class F) that corresponds to 50 to 150 percent of the weight of one filter. If the scale cannot reproduce the value of the calibration weight to within 0.1 mg, conduct the multipoint calibration before use.

#### 11.0 Analytical Procedure

11.1 Record the data required on a sheet such as the one shown in Figure 5G-4. Use the same analytical balance for determining tare weights and final sample weights.

11.2 Handle each sample container as follows:

11.2.1 Container Nos. 1 and 1A. Treat the two filters according to the procedures outlined in Method 5, Section 11.2.1.

11.2.2 Container No. 2. Same as Method 5, Section 11.2.2, except that the beaker may be smaller than 250 ml.

11.2.3 Acetone Blank Container. Same as Method 5, Section 11.2.4, except that the beaker may be smaller than 250 ml.

#### 12.0 Data Analysis and Calculations

Carry out calculations, retaining at least one extra significant figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

12.1 Nomenclature.

$B_{ws}$  = Water vapor in the gas stream, proportion by volume (assumed to be 0.04).

$c_s$  = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (gr/dscf).

$E$  = Particulate emission rate, g/hr (lb/hr).

$E_{adj}$  = Adjusted particulate emission rate, g/hr (lb/hr).

$L_a$  = Maximum acceptable leakage rate for either a pretest or post-test leak-check, equal to 0.00057 m<sup>3</sup>/min (0.020 cfm) or 4 percent of the average sampling rate, whichever is less.

$L_p$  = Leakage rate observed during the post-test leak-check, m<sup>3</sup>/min (cfm).

$m_a$  = Mass of residue of acetone blank after evaporation, mg.

$m_{aw}$  = Mass of residue from acetone wash after evaporation, mg.

$m_n$  = Total amount of particulate matter collected, mg.

$M_w$  = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

$P_{bar}$  = Barometric pressure at the sampling site, mm Hg (in. Hg).

$PR$  = Percent of proportional sampling rate.

$P_s$  = Absolute gas pressure in dilution tunnel, mm Hg (in. Hg).

$P_{std}$  = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

$Q_{sd}$  = Average gas flow rate in dilution tunnel, calculated as in Method 2, Equation 2-8, dscm/hr (dscf/hr).

$T_m$  = Absolute average dry gas meter temperature (see Figure 5G-3), °K (°R).

$T_{mi}$  = Absolute average dry gas meter temperature during each 10-minute interval, *i*, of the test run, °K (°R).

$T_s$  = Absolute average gas temperature in the dilution tunnel (see Figure 5G-3), °K (°R).

$T_{si}$  = Absolute average gas temperature in the dilution tunnel during each 10 minute interval, *i*, of the test run, °K (°R).

$T_{std}$  = Standard absolute temperature, 293 °K (528 °R).

$V_a$  = Volume of acetone blank, ml.

$V_{aw}$  = Volume of acetone used in wash, ml.

$V_m$  = Volume of gas sample as measured by dry gas meter, dcm (dcf).

$V_{mi}$  = Volume of gas sample as measured by dry gas meter during each 10-minute interval, *i*, of the test run, dcm.

$V_{m(std)}$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_s$  = Average gas velocity in the dilution tunnel, calculated by Method 2, Equation 2-7, m/sec (ft/sec). The dilution tunnel dry gas molecular weight may be assumed to be 29 g/g mole (lb/lb mole).

$V_{si}$  = Average gas velocity in dilution tunnel during each 10-minute interval, *i*, of the test run, calculated by Method 2, Equation 2-7, m/sec (ft/sec).

$Y$  = Dry gas meter calibration factor.

$\Delta H$  = Average pressure differential across the orifice meter, if used (see Figure 5G-2), mm H<sub>2</sub>O (in. H<sub>2</sub>O).